

jc658 U.S. PTO  
09/22/0009-22-00  
A

**PATENT APPLICATION TRANSMITTAL LETTER**  
(Small Entity)

Docket No.  
2909

TO THE ASSISTANT COMMISSIONER FOR PATENTS

jc658 U.S. PTO  
09/22/00

Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

**George Burnett, et al**

For: **WATER RESISTANT AUDIBLE SIGNAL**

Enclosed are:

- Certificate of Mailing with Express Mail Mailing Label No. **EL491588735US**
- 3(Figs 1-3)** sheets of drawings.
- A certified copy of a application.
- Declaration  Signed.  Unsigned.
- Power of Attorney
- Information Disclosure Statement
- Preliminary Amendment
- Verified Statement(s) to Establish Small Entity Status Under 37 C.F.R. 1.9 and 1.27.
- Other:

**CLAIMS AS FILED**

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	13	- 20 =	0	x \$11.00	\$0.00
Indep. Claims	3	- 3 =	0	x \$41.00	\$0.00
Multiple Dependent Claims (check if applicable)	<input type="checkbox"/>				
					<b>BASIC FEE</b> \$365.00
					<b>TOTAL FILING FEE</b> \$365.00

- A check in the amount of **\$365.00** to cover the filing fee is enclosed.
- The Commissioner is hereby authorized to charge and credit Deposit Account No. **14-1131** as described below. A duplicate copy of this sheet is enclosed.
- Charge the amount of as filing fee.
- Credit any overpayment.
- Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated: September 22, 2000



Signature

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CC:

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: George A. Burnett et al.  
Application No.: New Application  
Filed: Herewith  
Title: WATER RESISTANT AUDIBLE SIGNAL

**STATEMENT CLAIMING SMALL ENTITY STATUS  
(37 CFR 1.9(f) and 1.27(b) - SMALL BUSINESS CONCERN**

I hereby state that the above identified small business concern qualifies as a small business concern, as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby state that rights under contract or law have been conveyed to, and remain with, the small business concern identified above, with regard to the invention described in the application identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c), if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

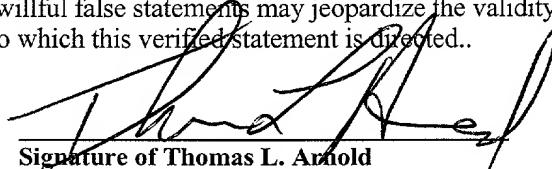
Each such person, concern or organization having any rights in the invention is listed below:

No such person, concern, or organization exists.

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed..

Date: 9/15/00

  
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TITLE: WATER RESISTANT AUDIBLE SIGNAL

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ATTORNEY DOCKET NO.: 2909

DRAFT ATTORNEY DOCKET

1

**Background of the Invention**

2       The present invention relates to an improved audible signal to provide audible alarms in  
3       a wide variety of devices including, for example, automobiles and trucks, industrial equipment,  
4       medical devices, traffic signals, appliances and the like. Such devices can use a piezoelectric  
5       transducer and associated circuitry to produce sound at a given frequency. The transducer flexes  
6       in response to an applied voltage. If an oscillating voltage is applied to the transducer at an  
7       appropriate rate, the flexing of the transducer produces an audible sound of substantial volume.

8       As the wide variety of potential uses shown above suggests, these audible signals need to be able  
9       to operate in a wide variety of conditions and environments. One problem facing such audible  
10      signals is water corrosion. Audible signals have always had a problem with liquids being able to  
11      gather in the front of the housing. Once the front of the audible signal housing fills with liquid,  
12      it is only a matter of time before the transducer corrodes and failures occur. In addition, the  
13      audible signal cannot emit a sound if there is an accumulation of liquid sitting on the transducer.  
14      Currently, audible alarms containing a piezoelectric transducers must be turned upside down to  
15      protect them from buildups of liquid in the front of the housing.

16       What is needed is an audible signal which includes a barrier against liquids, while at the  
17       same time generating a signal that is not dampened in decibel level by the barrier.

18       In the invention, the audible signal is sealed by a hydrophobic material, such as  
19       polytetrafluoroethylene (PTFE). Typically, a disc of such material can be suitably attached to the  
20       audible signal by means of a hot melt, sonic weld, silicone adhesive, or similar fastening means.

1 Such a hydrophobic material will result in an audible signal which is at least water resistant, while  
2 not materially affecting the decibel level or tone of the audible signal.

3                   **Summary of the Invention**

4                 According to the invention, there is provided a piezoelectric transducer and associated  
5 electrical circuitry to cause the transducer to oscillate at a resonant audible frequency. United  
6 States Patent No. 5,990,784 "Schmitt Trigger Loud Alarm With Feedback," is incorporated by  
7 reference herein and describes an alarm device using a piezoelectric transducer, and the circuitry  
8 used to perform such function. This patent is owned by the assignee of the present invention.  
9                 Typically, the housing of the transducer is hollow, and can include multiple sections with different  
10 diameters. The sound generated by the piezoelectric element and amplified within the chambers  
11 or cavities of the housing preferably are emitted through a grill or spaces within the last cavity.  
12                 One example of such a configuration, which is incorporated by reference, is shown in United  
13 States Patent Application 09/488,693, entitled "Extra Loud Low Frequency Acoustical Alarm  
14 Assembly," which was filed January 20, 2000 and is assigned to the assignee of the present  
15 invention.

16                 In this housing configuration, the transducer is mounted to a proximal tubular housing  
17 which is hollow, thus providing a first cavity. A second or distal tubular housing forms a second  
18 cavity adjoining the first cavity, and is of larger diameter than the first cavity. A third cavity  
19 adjoining the second cavity may optionally be employed. Sound is produced by the transducer and  
20 passes through the first cavity, second cavity and, if used, the third cavity. The sound is emitted  
21 through a grill on the last cavity. The present invention adds to this housing configuration by

1 adding a hydrophobic material (such as PTFE) which is attached to the front of the audible signal  
2 housing in order to block out, or at least resist any liquids from accumulating, while avoiding any  
3 significant dampening of the decibel level of the alarm signal.

4 The following terms are used in the claims of the patent as filed and are intended to have  
5 their broadest meaning consistent with the requirements of law.

6 A "front face" can include a front surface, grill or aperture through which sound generated  
7 by a piezoelectric transducer is designed to pass.

8 A "water resistant, sound permeable barrier adjacent the front face" can include a covering  
9 which is affixed to a front face surface or grill of a sound amplifying housing, and it can also  
10 include a hydrophobic, sound permeable surface affixed to the aperture defining the front face.

11 Where alternative meanings are possible, the broadest meaning is intended. All words used  
12 in the claims set forth below are intended to be used in the normal, customary usage of grammar  
13 and the English language.

#### 14 **Description of the Drawings**

15 Figure 1 is an exploded perspective schematic of the improved audible signal in conjunction  
16 with a mating knurled nut.

17 Figure 2 is a cross-section of the noise-making device including the water resistant barrier  
18 of the present invention.

19 Figure 3 is another cross-section of the improved noise-making device including the water  
20 resistant barrier and dimensions which have been determined to optimize the amplification.

1                   **Detailed Description of the Invention**

2                 Set forth below is a description of what is currently believed to be the preferred  
3                 embodiment or best example of the invention claimed. Future and present alternative and  
4                 modifications to this preferred embodiment are contemplated. Any alternatives or modifications  
5                 which make insubstantial changes in function, in purpose, in structure or in result are intended to  
6                 be covered by the claims of this patent.

7                 Referring to Figures 1 and 2, the present invention is directed to an improved housing and  
8                 assembly for a piezoelectric transducer. The assembly includes piezoelectric transducer housing  
9                 11, having a front grill 10 covered by a hydrophobic barrier 23. The barrier 23, is most  
10                 preferable made from PTFE, since this material is known to be water resistant, but is not known  
11                 to affect the sound of the piezoelectric transducer. However, those of ordinary skill in the art  
12                 having the present teaching in hand will be able to substitute alternative appropriate barriers which  
13                 have similar sound permeating features. The housing preferably is mated with a knurled nut, 31,  
14                 for mounting or fastening. The knurled nut 31 is likewise constructed from a similar hydrophobic  
15                 material, or it can have a hydrophobic barrier 23 which can also act to block liquids from the  
16                 piezoelectric housing 11. Alternatively, the knurled nut may not cover the front grill when  
17                 attached to the housing, but might nonetheless be preferably constructed of a hydrophobic material  
18                 in order to avoid mechanical degradation. The knurled nut preferably mates with the housing 11  
19                 by means of a threaded fit, such as the thread 24 shown in Figure 2.

20                 The hydrophobic barrier 23 is most preferably formed from PTFE which is cut into discs.  
21                 These discs are attached to the housing by means of a hot melt, sonic weld, silicon adhesive, or

1 other permanent attachment. In an alternative embodiment, the front face or grill 10 of housing  
2 11 might itself be made of PTFE in order to provide water resistant features.

3 Referring now to Figures 2 and 3, the housing is shown to contain a piezoelectric  
4 transducer 18. Transducer 18 is mounted at its nodal diameter to a knife-edge 17 at an end of a  
5 housing insert 16. Adhesive 19 binds the transducer 18 to the knife-edge 17. Knife-edge 17  
6 supports the transducer 18 while at the same time allowing the transducer to flex when a voltage  
7 is applied to it. Mounting the transducer at its nodal diameter minimizes interference with flexing  
8 of transducer 18.

9 Housing insert 16 is cylindrical in cross-section and hollow, forming a sound-amplifying  
10 cavity 15 next to the transducer 18. One suitable material for housing insert 16 is 6/6 nylon or  
11 "ABS." A source for 6/6 nylon is Zytel 101 available from Pro Tech Plastic Inc., 1295 West  
12 Helena Drive, West Chicago, Illinois, 60185. The length "A" of housing 16 is adjusted to  
13 maximize the amplification.

14 A main housing 11 is cylindrical in cross-section and hollow. Main housing 11 is attached  
15 to an end of housing insert 16. A flange 21 on main housing 11 engages and is secured by any  
16 convenient means to a flange 22 on insert 16. Main housing 11 is hollow, and has two cylindrical  
17 sections with different diameters. One cylindrical section forms a sound-amplifying cavity 13, and  
18 a second larger cylindrical section forms another sound-amplifying cavity 14. The diameters of  
19 cavities 13 and 15 are typically about the same, whereas the diameter "B" of cavity 14 is larger.  
20 A grill 10 may be attached to the end of housing 11 away from the transducer 18, and allows  
21 sound produced by the transducer, and amplified in the cavities, to be emitted and heard.

1       Figure 3 shows the invention with dimensions that have been found to produce a sound  
2       increase of about 10 to 15 dbA compared to devices using the same transducer and circuitry, but  
3       lacking the housing insert 16 and therefore having only one cavity. Dimension "A" is 0.438  
4       inches. Dimension "B" is 1.460 inches. Dimension "C" is 0.088 inches. Dimension "D" is 0.492  
5       inches. The diameters of housing 11 and housing insert 16 are 0.875 inches, approximately the  
6       same as the nodal diameter of transducer 18.

7           The above description is not intended to limit the meaning of the words used in the  
8       following claims that define the invention. Rather, it is contemplated that future modifications in  
9       structure, function or result will exist that are not substantial changes and that all such insubstantial  
10      changes in what is claimed are intended to be covered by the claims. For instance, the preferred  
11      embodiment of the present invention focuses upon a hydrophobic PTFE cover attached to the  
12      housing -- however, the advantages of the present invention could be equally applicable to a wide  
13      array of hydrophobic materials, and the invention is likewise intended to cover a housing front  
14      face constructed out of such hydrophobic materials. Likewise, it will be appreciated by those  
15      skilled in the art that various changes, additions, omissions, and modifications can be made to the  
16      illustrated embodiments without departing from the spirit of the present invention. All such  
17      modifications and changes are intended to be covered by the following claims.

1       We claim:

2           1. A noise-making device comprising:

3              a piezoelectric transducer;

4              a sound-amplifying housing adjacent the transducer, the sound-amplifying housing  
5              enclosing a space communicating with the transducer for receiving sound waves from the  
6              transducer, the sound amplifying housing further having a front face; and

7              a water resistant, sound permeable barrier adjacent to said front face.

8           2. The noise-making device of claim 1, wherein the water resistant, sound permeable

9              barrier is constructed of polytetrafluoroethylene.

10          3. The noise making device of claim 1, wherein the water resistant, sound permeable  
11          barrier is attached to the front face by a sonic weld.

12          4. The noise making device of claim 1, wherein the water resistant, sound permeable  
13          barrier is attached to the front face by a hot melt.

14          5. The noise making device of claim 1, wherein the water resistant, sound permeable  
15          barrier is attached to the front face by a silicone adhesive.

16           6. A noise-making assembly comprising:

17              a piezoelectric transducer;

18              a sound-amplifying housing adjacent the transducer, the sound-amplifying housing  
19              enclosing a space communicating with the transducer for receiving sound waves from the  
20              transducer, the sound amplifying housing further having a front face;

21              a water resistant, sound permeable barrier adjacent to said front face; and

1           a water resistant, hydrophobic fastener, said fastener mating with said sound-amplifying  
2         housing.

3           7.       The noise making assembly of claim 6, wherein the water resistant sound permeable  
4         barrier is integrally attached to said water resistant, hydrophobic fastener.

5           8.       The noise making assembly of claim 6, wherein the water resistant, sound  
6         permeable barrier is constructed of polytetrafluoroethylene

7           9.       The noise making assembly of claim 6, wherein the water resistant, hydrophobic  
8         fastener threadingly engages said sound amplifying housing.

9           10.      The noise making assembly of claim 6, wherein the front face of said sound  
10         amplifying housing includes at least one aperture.

11          11.      The noise making assembly of claim 6, wherein the front face of said sound  
12         amplifying housing comprises a grill.

13          12.      The noise making assembly of claim 6, wherein the front face of said sound  
14         amplifying housing is constructed of polytetrafluoroethylene.

15          13.      A noise-making device comprising:

16            a piezoelectric transducer;

17            a housing adjacent the transducer, the sound-amplifying housing enclosing a space  
18         communicating with the transducer for receiving sound waves from the transducer, the housing  
19         further having a front face; and

20            a polytetrafluoroethylene barrier adjacent to said front face.

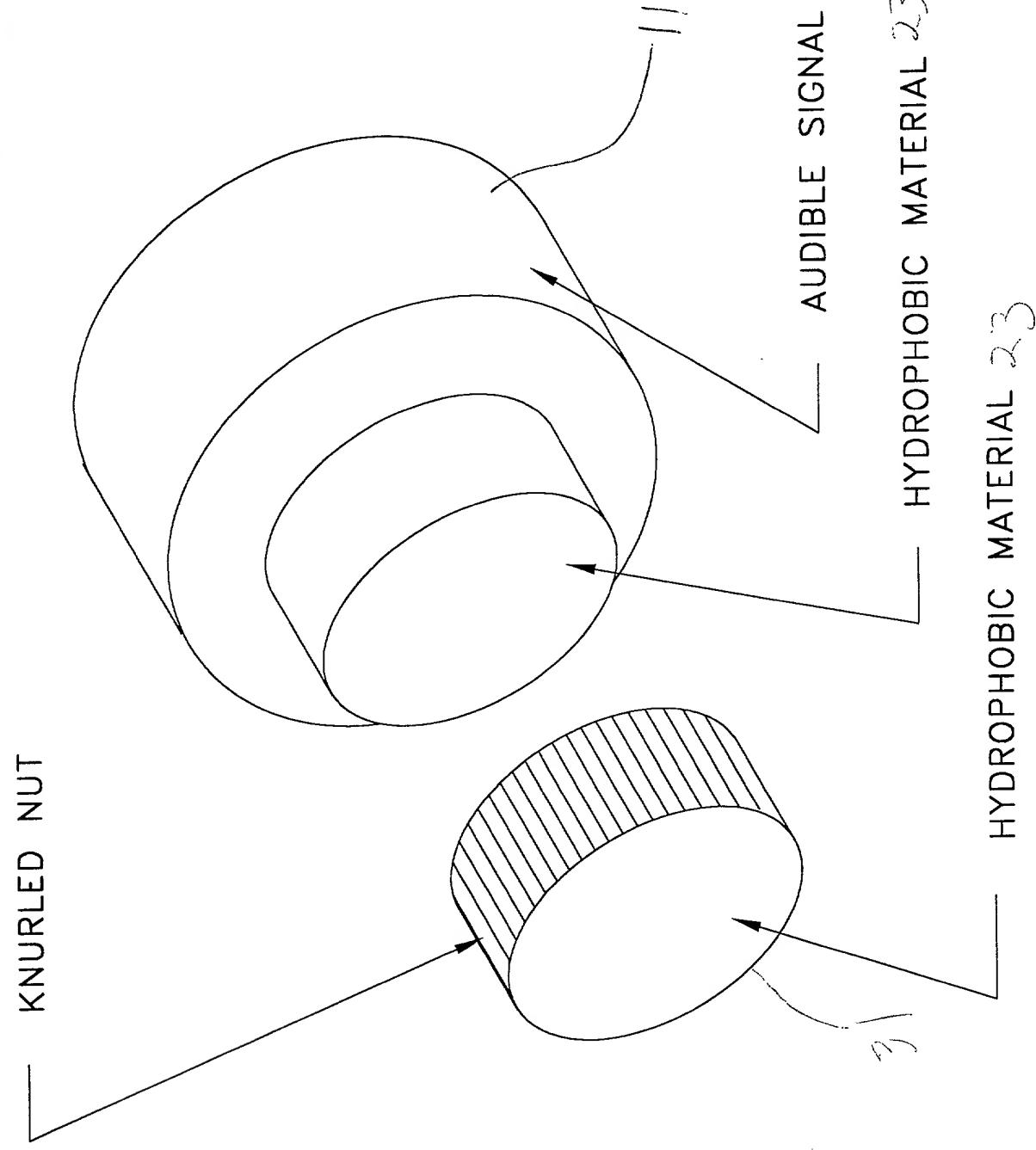
### **Abstract**

The invention is an modified audible signal, such as a piezoelectric noise-making and audible signaling device, which further includes a hydrophobic covering material, such as polytetrafluoroethylene (PTFE). The hydrophobic covering material is known to be water resistant, but does not effect the sound of the audible signaling device, thereby delaying or preventing the failure of the audible signaling device from water corrosion.

NORTH AMERICAN CAPACITOR COMPANY  
INDIANAPOLIS, INDIANA U.S.A.

MALLORY

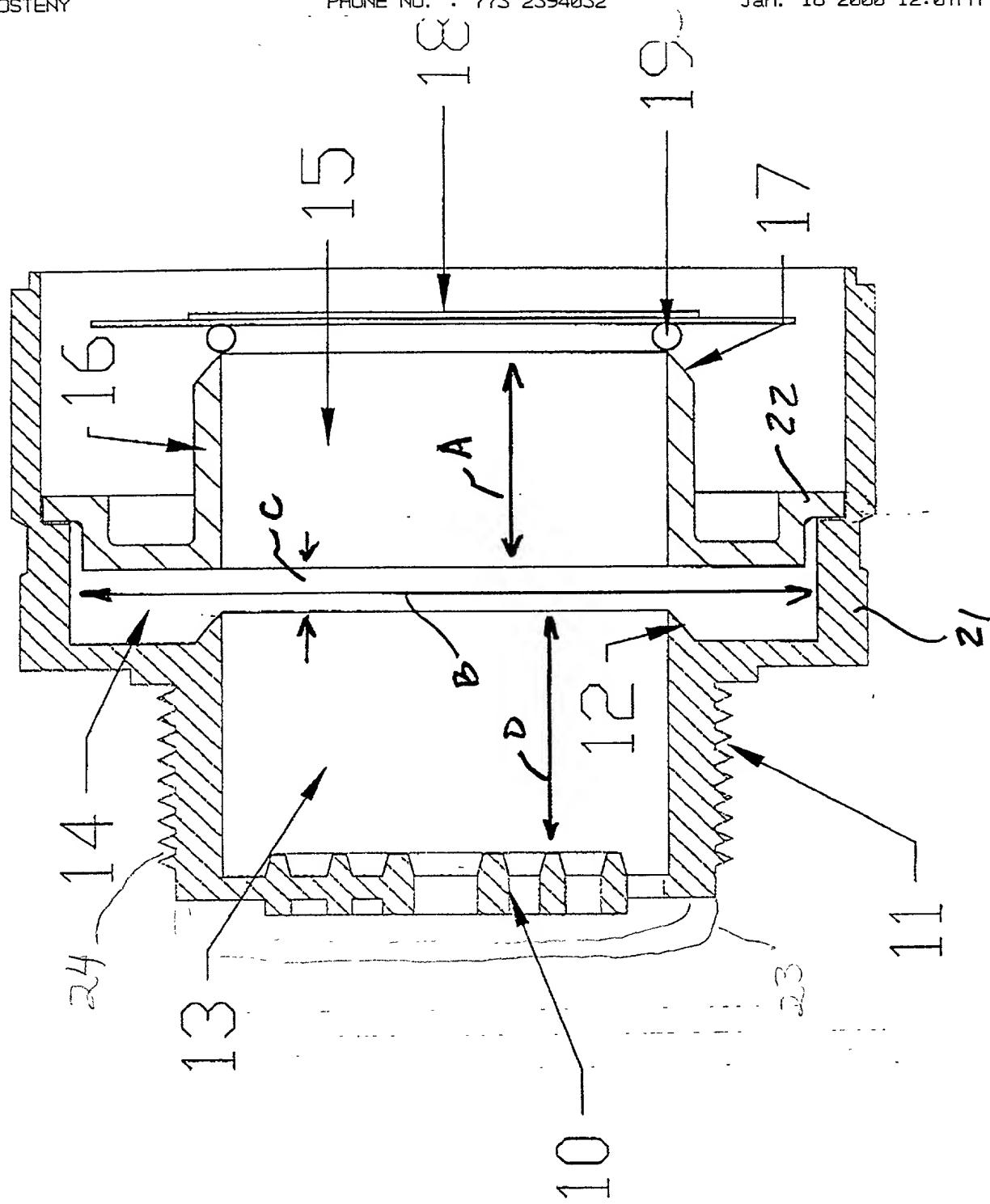
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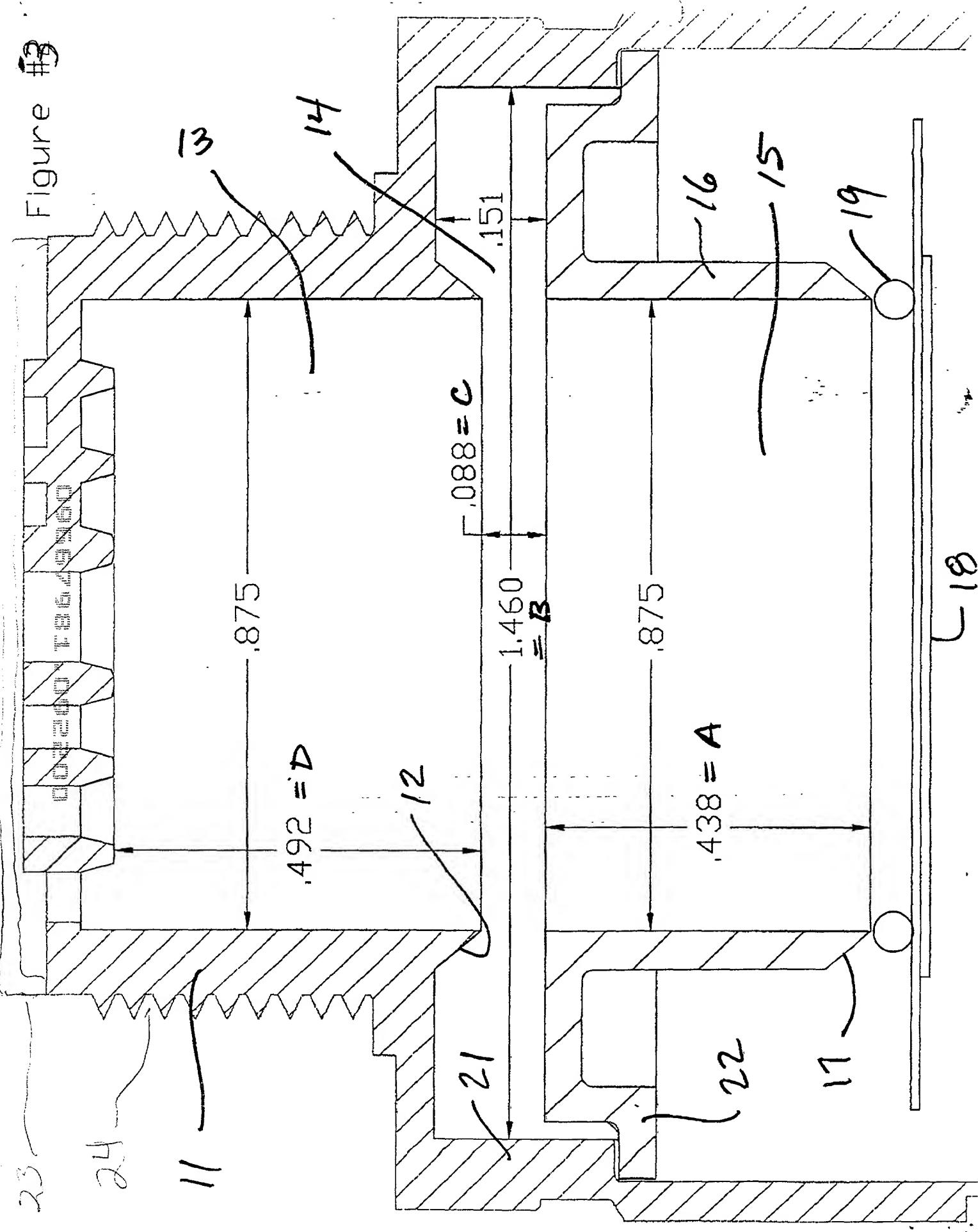
Figure #1

~~Extracochlear~~ Audible  
Signal Sound Cavity



Final Rev #2

Figure #3



Practitioner's Docket No. 2909

**PATENT**

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**COMBINED DECLARATION AND POWER OF ATTORNEY**

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,  
CONTINUATION, OR C-I-P)

---

As a below named inventor, I hereby declare that:

**TYPE OF DECLARATION**

This declaration is for an original application.

**INVENTORSHIP IDENTIFICATION**

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am an original, first and joint inventor of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

**TITLE OF INVENTION**

WATER RESISTANT AUDIBLE SIGNAL

**SPECIFICATION IDENTIFICATION**

The specification is attached herewith.

**ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56.

## POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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## DECLARATION

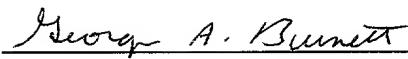
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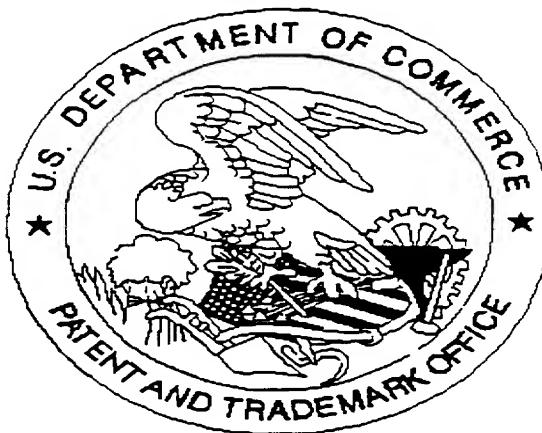
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